

## Impact of canal irrigation on the natural flora of Rajasthan

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### Abstract

The effect of canal irrigation over the last 66 years or so on the natural flora of North Rajasthan has been evaluated. In the irrigated regions, there are about 94 species which do not occur in the non-irrigated area of the Rajasthan Desert. It is observed that these extra-limital species have come to the irrigated regions by migration. Their seeds and other propagules have, obviously, been transported through irrigation waters. As many as 153 species which originally belong to the Rajasthan Desert have disappeared, obviously, as a result of protracted irrigation. The comparative studies show that 42 species of the irrigated regions have also become successfully established in the adjoining non-irrigated area. It is due to shadow effect of irrigation by canal-system.

### INTRODUCTION

North Rajasthan includes Ganganagar, Bikaner and Churu districts. Ganganagar and Bikaner districts are irrigated by a net-work of canal-system, drawing water from the rivers of Punjab. The Gang Canal, that draws water from the Sutlej in Punjab, was launched in 1927 and irrigates only Ganganagar district. The Rajasthan Canal, now named Indira Gandhi Canal introduced in 1957, has a distinction of being the longest canal-system in the world. It starts at Hari-ka-pattan in Punjab. At present this canal-system irrigates Ganganagar and Bikaner districts. However, the work of reaching this canal right up to Jaisalmer district is in progress. In Churu district agriculture is dependent on rain water, as at present it does not have the facility of canal irrigation.

The author is working on the flora of North Rajasthan (Singh, 1982, 1989; Singh & Brar, 1980, 1984; Singh & Dhillon, 1989; Singh & Sidhu, 1990; Singh & Singh 1990) and about 600 angiosperm species have been collected and identified. The plant specimens are preserved in the Herbarium, Department of Botany, S. G. N. Khalsa College, Sri Ganganagar.

### OBSERVATION AND DISCUSSION

A comparison of the flora of irrigated regions (Ganganagar and Bikaner districts) with that of Churu district and the rest of the Rajasthan Desert has been worked out. It has been observed that quite a number of species which

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have migrated to irrigated area, have not been reported from other parts of the Rajasthan Desert (Dhillon & Bajwa, 1969; Dhillon & Bhandari, 1974; Singh, 1982, 1989; Singh & Brar, 1980, 1984; Singh & Dhillon, 1989; Singh & Sidhu, 1990). A comparison of vegetation of the irrigated and non-irrigated regions in the North of Rajasthan State, shows that irrigation has brought about remarkable changes in the composition of original flora, both by way of introduction of extra-limital species as well as by elimination of many of the original species.

When compared to the natural flora of the Rajasthan Desert (Puri *et al.* 1964; Bhandari, 1990), the introduction of 94 species in the irrigated regions have been observed (Romana, 1991). The irrigation by a net-work of canal-system over the last 66 years or so in Ganganagar district has apparently changed about 21% of the species of the natural flora (Singh & Dhillon, 1989), whereas in Bikaner the change is mere 12% (Singh & Sidhu, 1990). Out of these 94 extra-limital species, 42 species have migrated in Churu district. The distribution of these species is restricted to Sahwa town only where canal water is pumped up for drinking and has been continuously spilling over for the last many years. This appears to be a judgment based on peripheral observation since the real change is much more subtle and not easily comprehensible. Some of these new entrants are temperate Himalayan plants such as *Ammi majus* Linn., *Arenaria serpyllifolia* Linn., *Astragalus subumbellatus* Klotzsch, *A. tribuloides* Del., *Cichorium intybus* Linn., *Cotula anthemoides* (Juss.) R. Br., *Verbascum thapsus* Linn. etc. Many of them are abundant in the cooler regions of the Punjab. It is therefore, obvious, that their seeds have been transported by irrigation water.

The natural flora has been modified in another manner also. It has been observed that 153 species of the non-irrigated desert which originally belonged to this area have disappeared, obviously, due to protracted irrigation (Romana, 1991). Most probably, this happened as a result of losing competition with the new entrants. With the availability of irrigation, large tracts are now under cultivation and waste lands have become scarce. Wild species can grow only at the sides of roads, canals or as crop weeds. These are regularly removed by the farmers from their fields. This reduction in the realm of wild plants has obviously contributed substantially to a reduction in the number of wild species. The above mentioned eliminated species still survive in the non-irrigated area of Bikaner, Churu and Jaisalmer districts, adjoining irrigated Rajasthan desert.

In the North-West of Rajasthan State, the Gang Canal, Bhakra Canal and Indira Gandhi Canal now form a tremendous net-work. Since the soils are rather sandy, the lateral seepage and percolation of water from the irrigated regions into adjoining non-irrigated area has been going on all this time. Due to this process which may be designated as shadow effect of irrigation, the

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edaphic condition in the non-irrigated area adjoining the irrigated regions have also become more congenial to some of the extra-limital species. These are now also migrating into the non-irrigated regions. Comparative studies show that as many as 42 species of irrigated area have also become successfully established in the adjoining non-irrigated regions (Romana, 1991).

An analysis of the floristic elements of the irrigated and non-irrigated regions of the Indian Desert shows that in the flora of irrigated regions there is conspicuous reduction in the percentage of Western (Saharo-Sindian & Sudano-Rajasthan) elements. On the contrary, Eastern (Indo-Malayan) and Temperate cold loving elements have increased (Singh, 1982).

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